DOCUMENT RESUME

ED 130 309 CS 203 022

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TITLE Perceptual Features, Semantic Roles, and Acquisition of Syntax. Report No. 28.
INSTITUTION Georgia Univ., Athens. Dept. of Language Education.
PUB DATE Nov 76
NOTE 15p.

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Child Language; Early Childhood; *Language Development; Psycholinguistics; *Semantics; Sentence Structure; *Syntax; Transformation Theory (Language)
IDENTIFIERS Chafe (Wallace); Clark (Herbert); Fillmore (Charles)

ABSTRACT

The relationships between a child's perceptual space and the acquisition of language are discussed in light of the work of Clark, Fillmore, and Chafe. Early language is analyzed as a semantic structure where linguistic ties are established between semantic features and inherent and relational perceptual features. Of these, it is the relational features which provide the basis for identification of semantic role, which in turn provides the substructure for the construction of a syntactic system. (AA)

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PERCEPTUAL FEATURES, SEMANTIC ROLES AND ACQUISITION OF SYNTAX

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Studies in Language Education, Report No. 28
Department of Language Education, The University of Georgia
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November, 1976

CS 203 022

PERCEPTUAL FEATURES, SEMANTIC

ROLES AND ACQUISITION OF SYNTAX

Proponents of the innateness hypothesis of language acquisition assume that a child has some a priori knowledge of the structure of language which is brought to bear in the process of acquiring language. Just what this knowledge is and how it facilitates language learning has not yet been agreed upon by scholars in the field of psycholinguistics. However, as Herbert H. Clark (1973) has pointed out:

> . . .if a priori knowledge is to enter into the acquisition process, it must be transported by particular vehicles which can be followed through their course of development. Instead of appearing out of thin air, a priori knowledge must be seen as arising out of specific learning mechanisms, memory constraints, perceptual abilities, motor abilities, and the like (p.28).

Focusing on English expressions of space and time, Clark contends that the child acquires these expressions by learning how to apply them to a priori knowledge he has about space and time. This a priori knowledge is separate from language itself. It is innate in the sense that its exact form is dependent on man's biological endowment. Clark outlines his argument as follows:

> The child is born into a flat world with gravity, and he himself is endowed with eyes, ears, an upright posture, and other biological structure. These structures alone lead him to develop a perceptual space, a P-space, with very specific properties. Later on, the child must learn how to apply English spatial terms to this perceptual space, and so the structure of P-space determines in large part what he learns and how quickly he learns it. The notion is that the child cannot apply some term correctly if he does not already have the appropriate concept in his P-space. Since this is so, the concept of space underlying the English spatial terms, to be called L-space, should coincide with P-space: any property found in L-space should also be found in P-space (p. 28).

Clark gives an impressive description of the properties of P-space and L-space and shows how time expressions can be treated as a second level of L-space. Although his discussion does not attempt to answer all the questions about mediating mechanisms for the correlations between P-space, L-space, and temporal expressions, Clark presents a persuasive argument in support of his thesis. In his concluding remarks, Clark says:

> Although I have argued only that P-space is a prerequisite for the acquisition of spatial and temporal terms, this knowledge might well turn out to be prerequisite for far more of language than that. It would be very exciting, for example, if P-space could be implicated even in such fundamental properties of language as the syntactic notions subject of a sentence, agent of an action, object of a verb, and so on (p. 62).

Whether the localist theory of case alluded to by Clark in his closing paragraph has as much explanatory potential as he seems to think, it is true that "theories concerning space and location present intriguing possibilities for future work in language acquisition" (p. 63), particularly if such theories are extended to include the objects and beings that occupy that space and their roles in the events and states that human beings are capable of perceiving. It is my purpose in the present essay to explore in a tentative way some possible extensions of that kind in an attempt to identify a perceptual basis for the acquisition of syntax.

I assume that the distinction Clark makes between perceptual space and language space is valid and that language reflects the structure of perceptual space. Going beyond Clark's thesis, I note that perceptual space is occupied by objects, both animate and inanimate, and that these objects are or may be related to one another through various processes, actions and states. The relationships of objects in a given instance, may be defined by the roles they are perceived to take in a process, action, or state. If it is true that these perceptual roles have linguistic counterparts in the various semantic roles, including agent, instrument,

patient, etc. and that the semantic roles are related to syntactic functions in specifiable ways, then perceptual roles, mediated by semantic roles, could provide a basis for the child's acquisition of syntax.

The meaning of the term role as it is used in this essay is derived in part from the work of Fillmore (1968) and the work of Chafe (1970). Some highlights of their work are summarized in the following paragraphs.

According to Fillmore, the base structure of the sentence has two major constituents: modality, which includes negation, tense, mood, and aspect; and proposition, which is a tenseless set of relationships involving a verb and one or more nouns (and may involve embedded sentences). Each noun phrase is associated with the verb in a particular case relationship. The six case notions discussed by Fillmore are agentive, instrumental, dative, factitive, locative, and objective. Other cases suggested by Fillmore include benefactive, comitative, and temporal.

In Fillmore's words: "The case notions comprise a set of universal, presumably innate, concepts which identify certain types of judgments human beings are capable of making about events that are going on around them, judgments about such matters as who did it, who it happened to, and what got changed" (p. 24).

The analysis of semantic structure formulated by Chafe (1970) reflects the influence of Fillmore's theory of case relationships, but is in some respects more specific than Fillmore's theory. In Chafe's view, the sentence is build around a predicative element (semantic verb), which is usually accompanied by one or more nominal elements (semantic nouns). The human conceptual universe is dichotomized into the two major areas represented by these two kinds of elements, the area of the verb embracing

states and events and the area of the noun embracing things. The verb is assumed to be central, determining what the rest of the sentence is like, and the nouns peripheral.

According to Chafe's analysis, in sentences such as "The wood is dry" and "The rope is tight" a noun (wood, rope) is said to be in a certain state or condition (dry, tight). The verb is specified as a state and is accompanied by a noun which is its patient. Sentences such as "The wood dried," "Michael ran," and "Michael dried the wood" contain verbs not specified as states. Such nonstate verbs refer to events, which can be distinguished from states in that they answer the question what happened? Some nonstate verbs deal with processes and some with actions; others deal with both processes and actions. In a process a patient noun undergoes a change in state or condition. An action verb refers to something someone does, and the agent noun specifies the performer of action. In sentences such as "Michael dried the wood" the verb is both a process and an action: it involves a change in the condition of a patient noun (process), and it tells what the agent noun does (action). With the exception of ambient sentences (It's late, It's raining), every sentence contains an agent noun or a patient noun or both.

In addition to the noun-verb relations of patient and agent, Chafe identifies these relations: experiencer (Tom wanted a drink), beneficiary (Mary gave Tom the tickets), instrument (Tom cut the rope with a knife), complement (Tom ran a race), and location (The knife is in the box). Commenting on these seven relations (not necessarily all that exist), Chafe says:

> Six of these relations--all but instrument--are determined by the presence within the verb of a certain selectional unit. A state

> or process dictates the presence of a patient noun. An action verb dictates an agent noun. An experiential verb calls for an experiencer, a benefactive verb a beneficiary, a completable verb a complement, and a locative verb a location. An instrument noun depends basically on the presence of an action-process verb, although such a verb does not require the accompaniment of an instrument (p. 164).

Role, as I use the term, is similar to what Fillmore calls case and what Chafe calls noun-verb relations; but since case is primarily associated with syntax and relation is a general term, I prefer the more specific term role. Extending H. Clark's notion of the distinction between P-space and L-space, in which there is an implicit distinction between perceptual features and semantic features, I assume there is a valid distinction between perceptual role and semantic role. Furthermore, it seems obvious that perceptual features can be divided into at least two classes: inherent features, which are perceived as relatively stable properties of objects; and relational features, which may vary from one setting to another. Inherent features include shape sound, size, taste, texture, etc., and relational features include instigator, performer, cause, effect, source, goal, etc. (cf. Nilsen (1972) for McCoy's list of relational semantic features). Perceptual features may be linguistically encoded as semantic features, the combinations of inherent features defining the referential meanings of words and the combinations of relational features defining the semantic roles of words in relation to one another in sentences.

Although the names Chafe assigns his noun-verb relations are not entirely satisfactory as names for semantic roles, they are adequate for the purpose of this essay and some of them will be employed in the discussion to follow (cf. O'Donnell (1975) for an alternate nomenclature).

Chafe summarizes three kinds of processes involved in linguistic representation as follows:

> First, there are processes of "formation" by which a semantic structure is constructed at the outset. Second, there are processes of "transformation" by which a semantic structure is modified to become a surface structure, and by which, as well, an underlying phonological representation is converted into a phonetic one. And third, there are processes of "symbolization" by which postsemantic units of a surface representation are replaced by underlying phonological configurations (p. 55).

While all three of these processes demand the attention of those who seek an understanding of the acquisition of language, it is only the first two that concern us here. Chafe demonstrates impressively how his system accounts for the noun-verb relations in semantic structures, and in his discussion of "Some Postsemantic Processes" (pp. 234-267), he shows how the surface structure of a sentence may be related to its semantic structure. Although the details of his discussion are interesting and relevant to this essay, only his treatment of subjects and objects will be dealt with here. After demonstrating how subjects can be accounted for in terms of "new" and "old" information, Chafe says:

> . . .I am inclined to prefer an alternative explanation by which postsemantic subjects are established, not directly on the basis of the semantic distribution of new and old information, but instead on the basis of the semantic relations agent, patient, and so on (p. 243).

Chafe goes on to formulate a subject rule which says that: (a) in the environment of a passive verb a beneficiary noun becomes the subject if its root is not new; (b) otherwise, a patient noun becomes the subject; (c) for nonpassive verbs, an agent or experiencer noun takes priority in becoming the subject; (d) a beneficiary noun has the next priority; (e) otherwise a patient noun becomes the subject. He then formulates an object rule which says that a patient noun which is not converted into a

postsemantic subject by the preceding rule will become a postsemantic object. He alludes to the postsemantic conversion of nouns into indirect objects and prepositional phrases, but does not formulate specific rules.

Whether Chafe's rules represent the best explanation of the processes by which semantic structures become surface structures, they do illustrate the fact that there is a specifiable relationship between semantic roles and syntactic functions. Obviously, one thing involved in the acquisition of syntax is the learning of the nature of this relationship.

In an essay concerned with what the child learns about the meanings of words in the process of acquiring language, Eve V. Clark (1970) formulates a hypothesis about semantic feature acquisition.

> The Semantic Feature Hypothesis states that when the child first begins to use identifiable words, he does not know their full (adult) meaning: He only has partial entries for them in his lexicon, such that these partial entries correspond in some way to some of the features or components of meaning that would be present in the entries for the same words in the adult's lexicon. Thus, the child will begin by identifying the meaning of a word with only one or two features rather than with the whole combination of meaning components or features (qua Postal) that are used criterially by the adult. The acquisition of semantic knowledge, then will consist of adding more features of meaning to the lexical entry of the word until the child's combination of features in the entry for that word corresponds to the adult's (p. 72).

Although the hypothesis relates primarily to the issue of how words are used to refer to objects, it may have implications for the issue of how semantic roles are learned. Assuming the validity of the distinction between inherent and relational features, we note that although E. Clark's discussion of the Semantic Feature Hypothesis deals only with the acquisition of inherent features, it seems equally applicable to the acquisition of relational features. Thus, as features of words are learned to refer to objects, features are also learned to define semantic roles and relations of objects in various settings. It seems likely that in the

early stages of development the child may not perceive all the relational features that an adult perceives, but that the developmental process involves the addition of more relational features until the child's perception of role corresponds to the adult's.

It seems reasonable that a child in the initial stages of language acquisition would perceive that in a given event certain objects are involved in different ways, e.g., a mother and a bottle in the act of feeding the child. Although the roles of agent, instrument, and patient probably are not clearly defined at the beginning, there must be some elementary perception of their differences. As the child learns to use combinations of words to refer to processes, actions, and states, it is probable that the combinations of relational features become more like those in the language of adults.

The results of studies by Bloom (1970), Bowerman (1973) and others make it clear that some aspects of the structure of early utterances are more efficiently described in semantic than in syntactic terms. Bowerman found the theory of transformational grammar satisfactory in certain respects as a means of representing the linguistic knowledge underlying sentence production at an early stage of development, but concluded that "the use of transformational generative grammars for child language involves making some assumptions which are difficult to justify" (p. 222). She goes on to say:

> It seems plausible that at an early stage of grammatical development, children are able to produce combinations of words without having the same implicit understanding of their constituent structure as an adult speaker has. An understanding of the hierarchical organization of sentence constituents is probably not a necessary prerequisite at all for producing simple two- and three-term constructions. It is possible that children learn about constituent structure as their grammars gradually develop rather than controlling this information from the very beginning of word combination (p. 222).

More specifically, Bowerman found that the grammatical concept of subject is more abstract and powerful than is needed to represent the characteristics of early utterances. What appear to be subjects in children's earliest constructions almost always identify the initiators of actions described by verbs. With advancing maturity, the semantic functions of children's subjects become more diverse. She concludes that the transformational grammar account of subjects in early utterances may be an inaccurate representation of the knowledge children have.

> Instead, they may construct sentences from elements which, as they understand them, perform semantic functions like "agent," "action," "object acted upon," and "location." Certain semantic notions may be more easily grasped than others for nonlinguistic, cognitive reasons. "Agent," for example, appears to be understood earlier than, or at least is more attractive than, the concept of "person affected" by a state or action. According to this view, the early linguistic knowledge of Finnish and American children would include the information that the name for the initiator of an action precedes the name for the action, and that the name for an object receiving the force of an action follows the name for the action. As the child's grammar develops, he may gradually notice that various semantic notions are dealt with syntactically in similar ways, and only eventually come to the syntactic abstraction of "subject" (p. 223).

Bowerman's interpretation of her data is compatible with the picture that emerges from the various studies I have previously cited. I shall attempt to bring together the various strands from these studies in the following paragraphs.

First of all, H. Clark's distinction between perceptual space and language space is of fundamental significance. Just as the child cannot learn space and time words apart from his perception of space and time, he cannot acquire semantic features of other words without a basis in perceptual features. The distinction between inherent and relational features is also significant. The child builds on his perception of

inherent features in acquiring the referential meanings of words and on his perception of relational features in constructing phrases. E. Clark's Semantic Feature Hypothesis seems to be equally applicable to inherent and relational features, i.e., just as the child begins with only part of the features adults associate with a word and gradually acquires the remaining features, he begins with only a few relational features and gradually acquires all the features necessary to define the various semantic roles.

The early utterances of children are probably incomplete reflections of their underlying semantic and perceptual constructs. While it is no doubt true that the child's perceptions are limited by his level of cognitive development, it seems equally likely that his ability to express what he perceives is limited by his linguistic development. It is obvious that he lacks the full range of syntactic operators that adults use in linguistic communication and only gradually acquires the ability to use these devices precisely.

The strategy the child apparently uses is to select for linguistic encoding the objects whose roles in a given state or event are perceived by him to be most significant. As Bowerman indicates, the initiator of an action seems more prominent in the child's view than the person affected by the action. Perhaps to begin with the child can attend to only one object at a time in an event, then two at a time, then more. At any rate, the structure of these early utterances seems to be adequately explained in terms of semantic roles.

In associating adult linguistic expressions with the events and states they represent, the child evidently learns the typical order of the terms expressed, and it is likely that relational features are strongly associated with the linear positions of these terms. Thus, in English, since the name

for agent usually precedes the name for action and the name for patient usually follows, the child's early utterances place the name for initiator of action before the name for action and the name of the person or object affected by the action after the name for action. Likewise, in English, the name for an attribute of an object usually precedes the name of the object in both adult and child speech. The grammatical notions of subject, direct object, modifier, etc. are much more abstract and apparently develop later (perhaps the syntactic properties of nouns and verbs are also more abstract than the semantic notions and are not necessary in descriptions of the earliest linguistic utterances of children).

At some point in the child's linguistic development rules governing subjects and objects (rules of the sort formulated by Chafe) are acquired by the child, and at that point, syntactic description of the child's language becomes feasible. The child has acquired a recognizable syntactic system, and it can be traced back to the child's a priori knowledge of his perceptual universe. Instead of appearing out of thin air, it can be seen as arising out of specific learning mechanisms, as H. Clark says it must. Perceptual abilities evidently provide the basis for all of language acquisition, including the syntactic rules and such abstract notions as subject of a sentence; but before the child arrives at the highly abstract level of syntactic structure he must go through the level of semantic structure where linguistic ties are established between semantic and perceptual features, both inherent and relational. And it is the relational features that provide the basis for identification of semantic role, which in turn provides the substructure for the construction of a syntactic system.

Obviously, this essay has not dealt with all the issues and unanswered questions surrounding the processes of language acquisition.

The relationships between the various semantic roles and the syntactic functions of subject, direct object, and modifier, for example, are complex enough to present a formidable learning task for the child, and the means by which the child accomplishes this task are not easily explained. Since these relationships can be specified by rules, however, they can be, and obviously are, learned by normal children in a relatively short period of time. The learning process involved is probably not different from that in learning other abstractions. At any rate, the argument that ability to perceive relational features is innate and that knowledge acquired through perception is subsequently applied in the acquisition of syntax appears to be a plausible argument.

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